

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2001-033356

(43)Date of publication of application : 09.02.2001

(51)Int.Cl.

G01M 19/00  
G01R 31/02

(21)Application number : 11-203842

(71)Applicant : FUJIKURA LTD

(22)Date of filing : 16.07.1999

(72)Inventor : SAKIYAMA KOJI

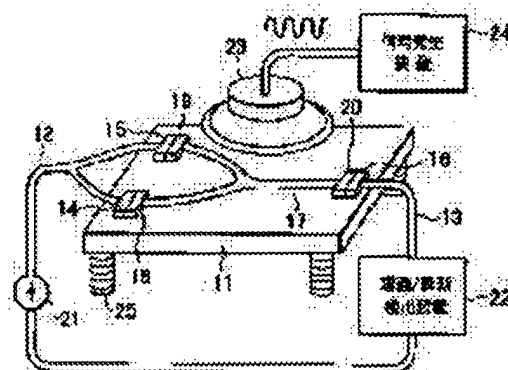
TAKEMURA YASUO

## (54) METHOD AND DEVICE FOR INSPECTING WIRE HARNESS

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To securely detect even the defect in connection that the contact pressure is low although an electric connection is made.

**SOLUTION:** By this inspecting method, connector parts 18 to 20 of a wire harness 17 to be inspected which have the connector parts 18 to 20 at both the ends are connected to connector parts 14 to 16 of wire harnesses 12 and 13 for continuity inspection and while a current is supplied to the wire harness 17 to be inspected through the wire harnesses 12 and 13, vibration or a shock is applied to the wire harness 17 to be inspected; and a continuity/momentary break detecting circuit 22 detects whether or not the current has a momentary break, thereby inspecting a defect in the connection of the wire harness 17.



## LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application]

converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of  
rejection]

[Date of requesting appeal against examiner's decision  
of rejection]

[Date of extinction of right]

Copyright (C); 1998,2003 Japan Patent Office

\* NOTICES \*

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

CLAIMS

---

[Claim(s)]

[Claim 1] The inspection approach of the wire harness characterized by inspecting the faulty connection of said inspected wire harness by connecting with the connector area of flow checking wire harness said connector area of the inspected wire harness which has a connector area to both ends, impressing vibration or an impact to said inspected wire harness, and detecting the existence of the hits of said current at that time where a current is passed to said inspected wire harness through said flow checking wire harness.

[Claim 2] The support means which supports the inspected wire harness which has a connector area to both ends, The flow checking wire harness connected with the connector area of said inspected wire harness, A current supply source means to supply a current to said inspected wire harness through said flow checking wire harness, Vibration / an impact impression means to impress vibration or an impact to said inspected wire harness where a current is passed to said inspected wire harness with this current supply source means, Test equipment of the wire harness characterized by having flow / a hits detection means to detect the existence of the hits of said current at the time of impression of the vibration or the impact to said inspected wire harness.

[Claim 3] Said vibration / impact impression means are test equipment of the wire harness according to claim 2 characterized by being a thing including the loudspeaker which emits an acoustic wave to said inspected wire harness, and a signal generation means to supply the signal of predetermined frequency to this loudspeaker.

[Claim 4] Said signal generation means is test equipment of the wire harness according to claim 3 characterized by being what carries out the sweep of the frequency of the signal supplied to said loudspeaker.

---

[Translation done.]

\* NOTICES \*

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

DETAILED DESCRIPTION

---

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the inspection approach of wire harness and equipment which detect especially the poor contact of a connector area certainly about the inspection approach of wire harness and equipment with which the connector area was formed in both ends.

[0002]

[Description of the Prior Art] With the wire harness which connects between the electric equipment articles of an automobile etc., a faulty connection may be woken up by deformation of the connection terminal of a connector area. For example, since the male terminal 4 will have predetermined contact pressure and it will be contacted between the piece 2 of a spring of the female mold terminal 1, and the piece 3 of induction if there is no deformation in the female mold terminal 1 of a connector area as shown in drawing 9 (a), the faulty connection who mentioned above is not produced. However, if a certain deformation is in the piece 2 of a spring of the female mold terminal 1 of a connector area as shown, for example in drawing 9 (b), Clearance delta will be formed between the piece 2 of a spring and the piece 3 of induction, and the male terminal 4, or although a clearance is not formed, it will become inadequate [ the contact pressure to the male terminal 4 of the female mold terminal 1 ], and poor contacts, such as hits of a connector area, will occur. This is an example of a poor contact, in addition the poor contact by poor sticking by pressure of a terminal and an electric wire also exists.

[0003] It is in the condition which connected inspected wire harness and flow checking wire harness, and he supplies a current to said inspected wire harness through flow checking wire harness, and was trying to inspect by observing the switch-on conventionally about the poor contact of such wire harness.

[0004]

[Problem(s) to be Solved by the Invention] However, by the inspection approach of the conventional wire harness mentioned above, when deformation of a female mold terminal is large and contact for a male terminal is severed completely, it is effective, but since the flow can be taken only by contact pressure being small when deformation of a female mold terminal is small, a poor contact is certainly undetectable. Moreover, it can say that it is the same about poor sticking by pressure of a terminal.

[0005] This invention aims at offering the inspection approach of wire harness and equipment certainly detectable also about a faulty connection who is low, although it was made in view of such a point and connects electrically.

[0006]

[Means for Solving the Problem] The inspection approach of the wire harness concerning this invention is characterized by inspecting the faulty connection of said inspected wire harness by connecting with the connector area of flow checking wire harness said connector area of the inspected wire harness which has a connector area to both ends, being in the condition which passed the current to said inspected wire harness through said flow checking wire harness, impressing vibration or an impact to said inspected wire harness, and detecting the existence of the hits of said current at that time.

[0007] Moreover, the test equipment of the wire harness concerning this invention The support means which supports the inspected wire harness which has a connector area to both ends, The flow checking wire harness connected with the connector area of said inspected wire harness, A current supply source means to supply a current to said inspected wire harness through said flow checking wire harness, Vibration / an impact impression means to impress vibration or an

impact to said inspected wire harness where a current is passed to said inspected wire harness with this current supply source means, It is characterized by having flow / a hits detection means to detect the existence of the hits of said current at the time of impression of the vibration or the impact to said inspected wire harness.

[0008] Although it connects electrically since he is trying to inspect the faulty connection of inspected wire harness by impressing vibration or an impact to inspected wire harness, and detecting the existence of the hits of the current at that time, where a current is passed to inspected wire harness according to this invention, faulty connections when the contact pressure is low can also detect certainly.

[0009] In addition, as said vibration / impact impression means, the loudspeaker which emits an acoustic wave to inspected wire harness, and a signal generation means to supply the signal of predetermined frequency to this loudspeaker shall be included. In this case, the resonance frequency of a proper will be passed into the connector area of inspected wire harness, or other parts, respectively, and by this, the frequency of the acoustic wave outputted from a loudspeaker as it is that to which said signal generation means carries out the sweep of the frequency of the signal supplied to said loudspeaker can impress an effective vibration to each part of wire harness, and can detect a poor contact more certainly.

[0010]

[Embodiment of the Invention] Hereafter, the gestalt of desirable operation of this invention is explained with reference to a drawing. Drawing 1 is drawing showing the configuration of the wire harness test equipment concerning one example of this invention. On the examining table 11, the connector areas 14, 15, and 16 of flow checking wire harness 12 and 13 are being fixed by the fixed means which is not illustrated. Inspected wire harness 17 is set on the examining table 11, where connector areas 18, 19, and 20 are connected to each connector areas 14, 15, and 16 of flow checking wire harness 12 and 13. A current is supplied to inspected wire harness 17 by the current source 21 through flow checking wire harness 12. This current is supervised with a flow / hits detection equipment 22 through flow checking wire harness 13. On the other hand, towards the examining table 11, a loudspeaker 23 is arranged in the state of a contact condition or non-contact, and the signal is supplied to this loudspeaker 23 from signal generation equipment 24. Vibration / impact impression means consists of this loudspeaker 23 and signal generation equipment 24. In addition, the foot 25 of the examining table 11 consists of hard members or elastic bodies with which vibration of the examining table 11 corresponding to the resonant frequency of inspected wire harness 17 18, for example, a connector area, - 20 grades is obtained.

[0011] The acoustic wave from a loudspeaker 23 is transmitted to inspected wire harness 17 through the examining table 11 by supplying the signal of a predetermined frequency to a loudspeaker 23 from signal generation equipment 24 in the condition of supplying the current to inspected wire harness 17 through flow checking wire harness 12 from the current source 21 as it is such a configuration. By this vibration, if a poor contact is in connector areas 18-20 or other parts, the so-called chattering which repeats a flow and un-flowing in that part will occur. A flow / hits detection equipment 22 detects this chattering, and a positive defective continuity inspection is attained.

[0012] In addition, in order to detect the hits of the current by the lack of contact pressure, the RS flip-flop circuit 33 which made the input of another side feed back the output of the gate circuits 31 and 32 as shown in drawing 2 mutually can be used for a flow / hits detection equipment 22. After resetting the RS flip-flop circuit 33 by the reset signal, the input signal which severs and falls at the time of current hits is inputted as a set input signal. Thereby, if an instant also has the hits of a current, a hits owner signal becomes active and is fixed. In addition, also in not flowing, a flow / hits detection equipment 22 can detect not only the hits of a current but completely as usual.

[0013] Drawing 3 is what inspected extent of a poor contact quantitatively, it forms the single-shot trigger circuit 42 which outputs the pulse of constant width at the time of the standup of the RS flip-flop circuit 41 as shown by drawing 2, counts the output of this single-shot trigger circuit 42 with a counter 43, and displays it with a drop 44. The output of a single-shot trigger circuit 42 is delayed in a delay circuit 45, and is given as a reset signal of the RS flip-flop circuit 41. According to this configuration, since the count of hits counts with a counter 43, a faulty connection's extent can be known by that counted value.

[0014] The signal generation equipment 24 shown in drawing 1 outputs a signal in which a frequency carries out a sweep preferably. In this case, as shown in drawing 4, an efficient vibration can be impressed to inspected wire harness 17 by supplying a signal to a loudspeaker 23 so that the resonance frequency  $f_0$  of a proper may be passed in inspected wire harness 17 or examining-table 11 grade.

[0015] Moreover, as shown in drawing 5, it equips with the resonance plates 51, 52, and 53 with which resonance

frequency differs, respectively, connector areas 14-16 are fixed to these resonance plates 51-53, respectively, and it may be made to carry out the sweep of the output signal frequency to the part to which the connector areas 14-16 of the examining table 11 are connected with signal generation equipment 24. In this case, since each resonance plates 51, 52, and 53 will resonate in order as shown in drawing 6, it is detectable from oscillation frequency and the hits detection timing in a flow / hits detection equipment 22 whether the poor contact occurred in which connector area.

[0016] In addition, although the loudspeaker 23 using an acoustic wave and signal generation equipment 24 were used as vibration / an impact impression means in the above example For example, as shown in drawing 7, the impact impression equipment 61 which impresses a single shot-impulse wave to inspected wire harness 17, and the signal generation equipment 62 which supplies a single shot to this impact impression equipment 61 are formed. It may be made to perform hits detection by adding an impact [ be / single shot-/ it / intermittent ] to the examining table 11 with impact impression equipment 61. In this case, the distance L1, L2, and L3 from the impact impression point P by impact impression equipment 61 to each connector areas 14, 15, and 16 is changed. Since a difference comes out by this to the time amount from impact impression timing to the hits timing in each connector areas 14-16 as shown in drawing 8, it is detectable by detecting this time difference whether they are the hits by the poor contact in which connector areas 18-19.

[0017]

[Effect of the Invention] Although it connects electrically since he is trying to inspect the faulty connection of inspected wire harness by impressing vibration or an impact to inspected wire harness where a current is passed to inspected wire harness according to this invention as stated above, and detecting the existence of the hits of the current at that time, the effectiveness that faulty connections when that contact pressure is low can also detect certainly is done so.

---

[Translation done.]

\* NOTICES \*

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

TECHNICAL FIELD

---

[Field of the Invention] This invention relates to the inspection approach of wire harness and equipment which detect especially the poor contact of a connector area certainly about the inspection approach of wire harness and equipment with which the connector area was formed in both ends.

---

[Translation done.]

\* NOTICES \*

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

PRIOR ART

---

[Description of the Prior Art] With the wire harness which connects between the electric equipment articles of an automobile etc., a faulty connection may be woken up by deformation of the connection terminal of a connector area. For example, since the male terminal 4 will have predetermined contact pressure and it will be contacted between the piece 2 of a spring of the female mold terminal 1, and the piece 3 of induction if there is no deformation in the female mold terminal 1 of a connector area as shown in drawing 9 (a), the faulty connection who mentioned above is not produced. However, if a certain deformation is in the piece 2 of a spring of the female mold terminal 1 of a connector area as shown, for example in drawing 9 (b), Clearance delta will be formed between the piece 2 of a spring and the piece 3 of induction, and the male terminal 4, or although a clearance is not formed, it will become inadequate [ the contact pressure to the male terminal 4 of the female mold terminal 1 ], and poor contacts, such as hits of a connector area, will occur. This is an example of a poor contact, in addition the poor contact by poor sticking by pressure of a terminal and an electric wire also exists.

[0003] It is in the condition which connected inspected wire harness and flow checking wire harness, and he supplies a current to said inspected wire harness through flow checking wire harness, and was trying to inspect by observing the switch-on conventionally about the poor contact of such wire harness.

---

[Translation done.]



\* NOTICES \*

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

EFFECT OF THE INVENTION

---

[Effect of the Invention] Although it connects electrically since he is trying to inspect the faulty connection of inspected wire harness by impressing vibration or an impact to inspected wire harness where a current is passed to inspected wire harness according to this invention as stated above, and detecting the existence of the hits of the current at that time, the effectiveness that faulty connections when that contact pressure is low can also detect certainly is done so.

---

[Translation done.]

\* NOTICES \*

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

TECHNICAL PROBLEM

---

[Problem(s) to be Solved by the Invention] However, by the inspection approach of the conventional wire harness mentioned above, when deformation of a female mold terminal is large and contact for a male terminal is severed completely, it is effective, but since the flow can be taken only by contact pressure being small when deformation of a female mold terminal is small, a poor contact is certainly undetectable. Moreover, it can say that it is the same about poor sticking by pressure of a terminal.

[0005] This invention aims at offering the inspection approach of wire harness and equipment certainly detectable also about a faulty connection who is low, although it was made in view of such a point and connects electrically.

---

[Translation done.]

\* NOTICES \*

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

MEANS

---

[Means for Solving the Problem] The inspection approach of the wire harness concerning this invention is characterized by inspecting the faulty connection of said inspected wire harness by connecting with the connector area of flow checking wire harness said connector area of the inspected wire harness which has a connector area to both ends, being in the condition which passed the current to said inspected wire harness through said flow checking wire harness, impressing vibration or an impact to said inspected wire harness, and detecting the existence of the hits of said current at that time.

[0007] Moreover, the test equipment of the wire harness concerning this invention The support means which supports the inspected wire harness which has a connector area to both ends, The flow checking wire harness connected with the connector area of said inspected wire harness, A current supply source means to supply a current to said inspected wire harness through said flow checking wire harness, Vibration / an impact impression means to impress vibration or an impact to said inspected wire harness where a current is passed to said inspected wire harness with this current supply source means, It is characterized by having flow / a hits detection means to detect the existence of the hits of said current at the time of impression of the vibration or the impact to said inspected wire harness.

[0008] Although it connects electrically since he is trying to inspect the faulty connection of inspected wire harness by impressing vibration or an impact to inspected wire harness, and detecting the existence of the hits of the current at that time, where a current is passed to inspected wire harness according to this invention, faulty connections when the contact pressure is low can also detect certainly.

[0009] In addition, as said vibration / impact impression means, the loudspeaker which emits an acoustic wave to inspected wire harness, and a signal generation means to supply the signal of predetermined frequency to this loudspeaker shall be included. In this case, the resonance frequency of a proper will be passed into the connector area of inspected wire harness, or other parts, respectively, and by this, the frequency of the acoustic wave outputted from a loudspeaker as it is that to which said signal generation means carries out the sweep of the frequency of the signal supplied to said loudspeaker can impress an effective vibration to each part of wire harness, and can detect a poor contact more certainly.

[0010]

[Embodiment of the Invention] Hereafter, the gestalt of desirable operation of this invention is explained with reference to a drawing. Drawing 1 is drawing showing the configuration of the wire harness test equipment concerning one example of this invention. On the examining table 11, the connector areas 14, 15, and 16 of flow checking wire harness 12 and 13 are being fixed by the fixed means which is not illustrated. Inspected wire harness 17 is set on the examining table 11, where connector areas 18, 19, and 20 are connected to each connector areas 14, 15, and 16 of flow checking wire harness 12 and 13. A current is supplied to inspected wire harness 17 by the current source 21 through flow checking wire harness 12. This current is supervised with a flow / hits detection equipment 22 through flow checking wire harness 13. On the other hand, towards the examining table 11, a loudspeaker 23 is arranged in the state of a contact condition or non-contact, and the signal is supplied to this loudspeaker 23 from signal generation equipment 24. Vibration / impact impression means consists of this loudspeaker 23 and signal generation equipment 24. In addition, the foot 25 of the examining table 11 consists of hard members or elastic bodies with which vibration of the examining table 11 corresponding to the resonant frequency of inspected wire harness 17 18, for example, a connector area, - 20 grades is obtained.

[0011] The acoustic wave from a loudspeaker 23 is transmitted to inspected wire harness 17 through the examining

table 11 by supplying the signal of a predetermined frequency to a loudspeaker 23 from signal generation equipment 24 in the condition of supplying the current to inspected wire harness 17 through flow checking wire harness 12 from the current source 21 as it is such a configuration. By this vibration, if a poor contact is in connector areas 18-20 or other parts, the so-called chattering which repeats a flow and un-flowing in that part will occur. A flow / hits detection equipment 22 detects this chattering, and a positive defective continuity inspection is attained.

[0012] In addition, in order to detect the hits of the current by the lack of contact pressure, the RS flip-flop circuit 33 which made the input of another side feed back the output of the gate circuits 31 and 32 as shown in drawing 2 mutually can be used for a flow / hits detection equipment 22. After resetting the RS flip-flop circuit 33 by the reset signal, the input signal which severs and falls at the time of current hits is inputted as a set input signal. Thereby, if an instant also has the hits of a current, a hits owner signal becomes active and is fixed. In addition, also in not flowing, a flow / hits detection equipment 22 can detect not only the hits of a current but completely as usual.

[0013] Drawing 3 is what inspected extent of a poor contact quantitatively, it forms the single-shot trigger circuit 42 which outputs the pulse of constant width at the time of the standup of the RS flip-flop circuit 41 as shown by drawing 2, counts the output of this single-shot trigger circuit 42 with a counter 43, and displays it with a drop 44. The output of a single-shot trigger circuit 42 is delayed in a delay circuit 45, and is given as a reset signal of the RS flip-flop circuit 41. According to this configuration, since the count of hits counts with a counter 43, a faulty connection's extent can be known by that counted value.

[0014] The signal generation equipment 24 shown in drawing 1 outputs a signal in which a frequency carries out a sweep preferably. In this case, as shown in drawing 4, an efficient vibration can be impressed to inspected wire harness 17 by supplying a signal to a loudspeaker 23 so that the resonance frequency  $f_0$  of a proper may be passed in inspected wire harness 17 or examining-table 11 grade.

[0015] Moreover, as shown in drawing 5, it equips with the resonance plates 51, 52, and 53 with which resonance frequency differs, respectively, connector areas 14-16 are fixed to these resonance plates 51-53, respectively, and it may be made to carry out the sweep of the output signal frequency to the part to which the connector areas 14-16 of the examining table 11 are connected with signal generation equipment 24. In this case, since each resonance plates 51, 52, and 53 will resonate in order as shown in drawing 6, it is detectable from oscillation frequency and the hits detection timing in a flow / hits detection equipment 22 whether the poor contact occurred in which connector area.

[0016] In addition, although the loudspeaker 23 using an acoustic wave and signal generation equipment 24 were used as vibration / an impact impression means in the above example For example, as shown in drawing 7, the impact impression equipment 61 which impresses a single shot-impulse wave to inspected wire harness 17, and the signal generation equipment 62 which supplies a single shot to this impact impression equipment 61 are formed. It may be made to perform hits detection by adding an impact [ be / single shot-/ it / intermittent ] to the examining table 11 with impact impression equipment 61. In this case, the distance L1, L2, and L3 from the impact impression point P by impact impression equipment 61 to each connector areas 14, 15, and 16 is changed. Since a difference comes out by this to the time amount from impact impression timing to the hits timing in each connector areas 14-16 as shown in drawing 8, it is detectable by detecting this time difference whether they are the hits by the poor contact in which connector areas 18-19.

---

[Translation done.]

\* NOTICES \*

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

DESCRIPTION OF DRAWINGS

---

[Brief Description of the Drawings]

[Drawing 1] It is drawing showing the configuration of the wire harness test equipment concerning one example of this invention.

[Drawing 2] It is the circuit diagram of the important section of the flow / hits detection equipment in this equipment.

[Drawing 3] It is the circuit diagram showing other examples of the said flow / hits detection equipment.

[Drawing 4] It is drawing showing the relation between the output frequency of signal generation equipment, and the resonance frequency of wire harness to this equipment.

[Drawing 5] It is drawing showing the configuration of the wire harness test equipment concerning other examples of this invention.

[Drawing 6] It is drawing showing the resonance frequency of each part for explaining actuation of this equipment.

[Drawing 7] It is drawing showing the configuration of the wire harness test equipment concerning the example of further others of this invention.

[Drawing 8] It is a timing chart for explaining actuation of this equipment.

[Drawing 9] It is the sectional view showing the important section configuration of the connector area of inspected wire harness.

[Description of Notations]

1 [ -- Flow checking wire harness, 14-16, 18-20 / -- A connector area, 17 / -- Inspected wire harness, 21 / -- A current source, 22 / -- A flow / hits detection equipment 23 / -- 24 A loudspeaker, 62 / -- Signal generation equipment, 51-53 / - A resonance plate, 61 / -- Impact impression equipment. ] -- A female mold terminal, 4 -- A male terminal, 11 -- 12 The examining table, 13

---

[Translation done.]

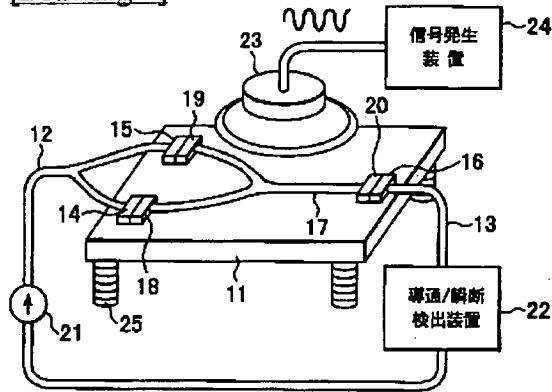
## \* NOTICES \*

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

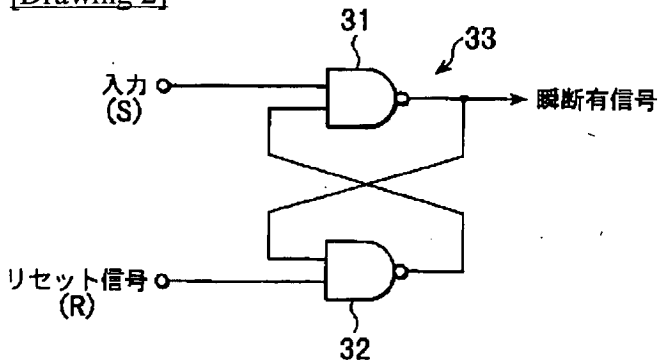
1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

## DRAWINGS

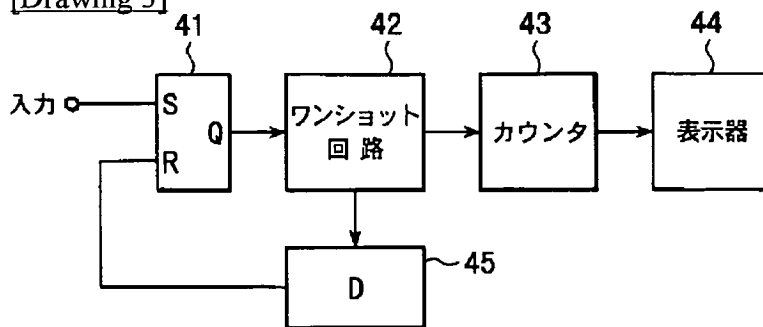
[Drawing 1]



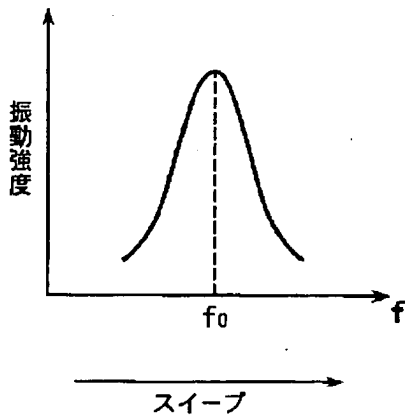
[Drawing 2]



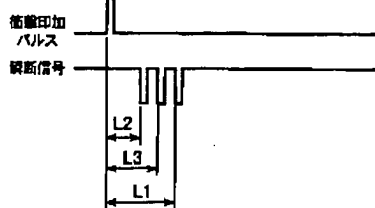
[Drawing 3]



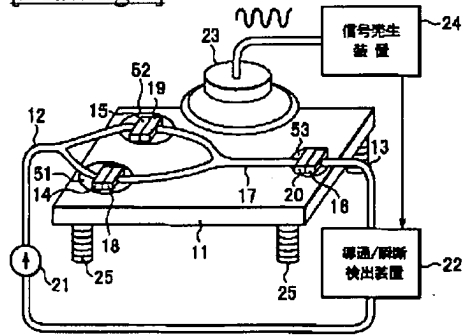
[Drawing 4]



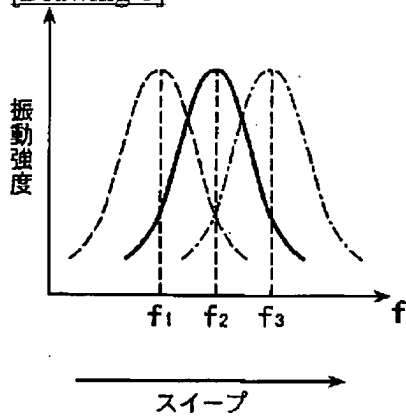
[Drawing 8]



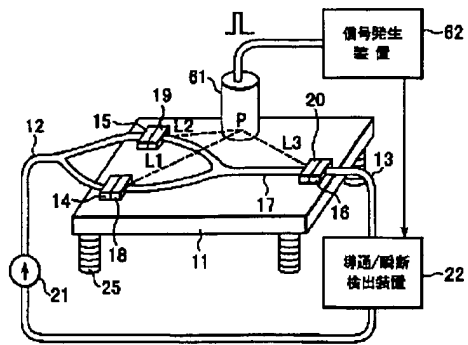
[Drawing 5]



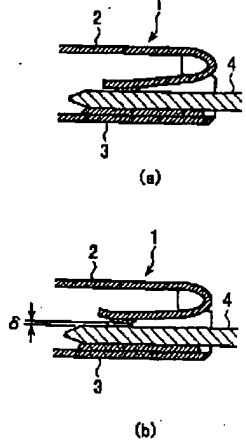
[Drawing 6]



[Drawing 7]



[Drawing 9]



[Translation done.]



(19)日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11)特許出願公開番号

特開2001-33356

(P2001-33356A)

(43)公開日 平成13年2月9日(2001.2.9)

(51)Int.Cl.

識別記号

F I

テマコード(参考)

G 0 1 M 19/00

G 0 1 M 19/00

Z 2 G 0 1 4

G 0 1 R 31/02

G 0 1 R 31/02

2 G 0 2 4

審査請求 未請求 請求項の数4 O L (全 5 頁)

(21)出願番号 特願平11-203842

(22)出願日 平成11年7月16日(1999.7.16)

(71)出願人 000005186

株式会社フジクラ

東京都江東区木場1丁目5番1号

(72)発明者 ▲崎▼山 興治

千葉県佐倉市六崎1440番地 株式会社フジ  
クラ佐倉事業所内

(72)発明者 竹村 安男

千葉県佐倉市六崎1440番地 株式会社フジ  
クラ佐倉事業所内

(74)代理人 100092820

弁理士 伊丹 勝

Fターム(参考) 2G014 AA13 AA14 AA29 AB38 AB60

AC07

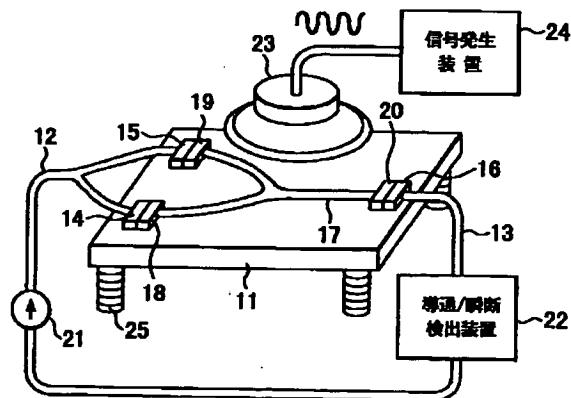
2G024 AD31 CA18 DA12

(54)【発明の名称】 ワイヤハーネスの検査方法及び装置

(57)【要約】

【課題】 電気的には接続されているが、接触圧が低いような接続不良についても確実に検知する。

【解決手段】 両端にコネクタ部18~20を有する被検査ワイヤハーネス17のコネクタ部18~20を導通検査用ワイヤハーネス12, 13のコネクタ部14~16と接続し、導通検査用ワイヤハーネス12, 13を介して被検査ワイヤハーネス17に電流を流した状態で、被検査ワイヤハーネス17に振動又は衝撃を印加して、その時の電流の瞬断の有無を導通/瞬断検出回路22で検出することにより、被検査ワイヤハーネス17の接続不良を検査する。



## 【特許請求の範囲】

【請求項1】 両端にコネクタ部を有する被検査ワイヤハーネスの前記コネクタ部を導通検査用ワイヤハーネスのコネクタ部と接続し、前記導通検査用ワイヤハーネスを介して前記被検査ワイヤハーネスに電流を流した状態で、前記被検査ワイヤハーネスに振動又は衝撃を印加して、その時の前記電流の瞬断の有無を検出することにより、前記被検査ワイヤハーネスの接続不良を検査することを特徴とするワイヤハーネスの検査方法。

【請求項2】 両端にコネクタ部を有する被検査ワイヤハーネスを支持する支持手段と、前記被検査ワイヤハーネスのコネクタ部と接続される導通検査用ワイヤハーネスと、前記導通検査用ワイヤハーネスを介して前記被検査ワイヤハーネスに電流を供給する電流供給手段と、この電流供給手段で前記被検査ワイヤハーネスに電流を流した状態で前記被検査ワイヤハーネスに振動又は衝撃を印加する振動／衝撃印加手段と、前記被検査ワイヤハーネスへの振動又は衝撃の印加時の前記電流の瞬断の有無を検出する導通／瞬断検出手段とを備えたことを特徴とするワイヤハーネスの検査装置。

【請求項3】 前記振動／衝撃印加手段は、前記被検査ワイヤハーネスに音波を発するスピーカと、このスピーカに所定周波数の信号を供給する信号発生手段とを含むものであることを特徴とする請求項2記載のワイヤハーネスの検査装置。

【請求項4】 前記信号発生手段は、前記スピーカに供給する信号の周波数を掃引するものであることを特徴とする請求項3記載のワイヤハーネスの検査装置。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】本発明は、両端にコネクタ部が形成されたワイヤハーネスの検査方法及び装置に関し、特にコネクタ部の接続不良を確実に検出するワイヤハーネスの検査方法及び装置に関する。

## 【0002】

【従来の技術】自動車の電装部品間等を接続するワイヤハーネスでは、コネクタ部の接続端子の変形で接続不良を起こすことがある。例えば図9(a)に示すように、コネクタ部の雌型端子1に変形が無ければ、雌型端子1のバネ片2と誘導片3の間に、雄型端子4が所定の接触圧を持って接触されるので、上述した接続不良は生じない。しかし、例えば図9(b)に示すように、コネクタ部の雌型端子1のバネ片2に何らかの変形があると、バネ片2及び誘導片3と雄型端子4との間に隙間δが形成され、又は隙間は形成されないにしても雌型端子1の雄型端子4に対する接触圧が不十分となって、コネクタ部の瞬断等の接続不良が発生してしまう。これは接続不良の一例であり、この他にも端子と電線の圧着不良による

接触不良も存在する。

【0003】このようなワイヤハーネスの接続不良については、従来、被検査ワイヤハーネスと導通検査用ワイヤハーネスとを接続した状態で、導通検査用ワイヤハーネスを介して前記被検査ワイヤハーネスに電流を供給し、その導通状態を観測することにより検査するようにしていた。

## 【0004】

【発明が解決しようとする課題】しかし、上述した従来のワイヤハーネスの検査方法では、雌型端子の変形が大きく雄型端子との接触が完全に断たれているときには有効であるが、雌型端子の変形が小さい場合には、接触圧が小さいだけで導通はとれているために、接続不良を確実に検出することができない。また、端子の圧着不良についても同様のことが言える。

【0005】本発明は、このような点に鑑みなされたもので、電気的には接続されているが、接触圧が低いような接続不良についても確実に検知することができるワイヤハーネスの検査方法及び装置を提供することを目的とする。

## 【0006】

【課題を解決するための手段】本発明に係るワイヤハーネスの検査方法は、両端にコネクタ部を有する被検査ワイヤハーネスの前記コネクタ部を導通検査用ワイヤハーネスのコネクタ部と接続し、前記導通検査用ワイヤハーネスを介して前記被検査ワイヤハーネスに電流を流した状態で、前記被検査ワイヤハーネスに振動又は衝撃を印加して、その時の前記電流の瞬断の有無を検出することにより、前記被検査ワイヤハーネスの接続不良を検査することを特徴とする。

【0007】また、本発明に係るワイヤハーネスの検査装置は、両端にコネクタ部を有する被検査ワイヤハーネスを支持する支持手段と、前記被検査ワイヤハーネスのコネクタ部と接続される導通検査用ワイヤハーネスと、前記導通検査用ワイヤハーネスを介して前記被検査ワイヤハーネスに電流を供給する電流供給手段と、この電流供給手段で前記被検査ワイヤハーネスに電流を流した状態で前記被検査ワイヤハーネスに振動又は衝撃を印加する振動／衝撃印加手段と、前記被検査ワイヤハーネスへの振動又は衝撃の印加時の前記電流の瞬断の有無を検出する導通／瞬断検出手段とを備えたことを特徴とする。

【0008】本発明によれば、被検査ワイヤハーネスに電流を流した状態で、被検査ワイヤハーネスに振動又は衝撃を印加して、その時の電流の瞬断の有無を検出することにより、被検査ワイヤハーネスの接続不良を検査するようにしているので、電気的には接続されているが、その接触圧が低い場合等の接続不良も確実に検知することができる。

【0009】なお、前記振動／衝撃印加手段としては、被検査ワイヤハーネスに音波を発するスピーカと、この

スピーカに所定周波数の信号を供給する信号発生手段とを含むものとすることができる。この場合、前記信号発生手段が、前記スピーカに供給する信号の周波数を掃引するものであると、スピーカから出力される音波の周波数が被検査ワイヤハーネスのコネクタ部やその他の部分に固有の共振周波数をそれぞれ通過することになり、これによって、効果的な振動をワイヤハーネスの各部に印加することができ、より確実に接触不良を検知することができる。

#### 【0010】

【発明の実施の形態】以下、図面を参照して本発明の好ましい実施の形態について説明する。図1は、この発明の一実施例に係るワイヤハーネス検査装置の構成を示す図である。検査台11の上には、導通検査用ワイヤハーネス12、13のコネクタ部14、15、16が、図示しない固定手段によって固定されている。被検査ワイヤハーネス17は、コネクタ部18、19、20が導通検査用ワイヤハーネス12、13の各コネクタ部14、15、16に接続された状態で検査台11の上にセットされる。被検査ワイヤハーネス17には、電流源21によ

って、導通検査用ワイヤハーネス12を介して電流が供給される。この電流は導通検査用ワイヤハーネス13を介して導通/瞬断検出装置22で監視される。一方、検査台11に向けて、接触状態又は非接触状態でスピーカ23が配置され、このスピーカ23に信号発生装置24から信号が供給されている。このスピーカ23と信号発生装置24とで振動/衝撃印加手段を構成する。なお、検査台11の脚25は、被検査ワイヤハーネス17の例えばコネクタ部18～20等の固有振動数に対応した検査台11の振動が得られるような硬質部材又は弾性体にて構成されている。

【0011】このような構成であると、電流源21から導通検査用ワイヤハーネス12を介して被検査ワイヤハーネス17に電流を供給している状態で、信号発生装置24からスピーカ23に所定の周波数の信号を供給することにより、スピーカ23からの音波が検査台11を介して被検査ワイヤハーネス17に伝達される。この振動により、コネクタ部18～20やその他の部分に接触不良があれば、その部分で導通、非導通を繰り返す、いわゆるチャタリングが発生する。導通/瞬断検出装置22がこのチャタリングを検出して、確実な導通不良検査が可能になる。

【0012】なお、接触圧不足による電流の瞬断を検出するために、導通/瞬断検出装置22には、例えば図2に示すような、ゲート回路31、32の出力を相互に他方の入力にフィードバックさせたRSフリップフロップ回路33を使用することができる。リセット信号によってRSフリップフロップ回路33をリセットした後、電流瞬断時に断ち下がる入力信号をセット入力信号として入力する。これにより、瞬時でも電流の瞬断があれば、

瞬断有信号がアクティブになって固定される。なお、導通/瞬断検出装置22は、電流の瞬断だけでなく、従来どおり完全に非導通の場合も検出できるものである。

【0013】図3は、接触不良の程度を定量的に検査するようにしたもので、図2で示したようなRSフリップフロップ回路41の立上り時に一定幅のパルスを出力するワンショット回路42を設け、このワンショット回路42の出力をカウンタ43でカウントして、表示器44で表示するようになっている。ワンショット回路42の出力は遅延回路45で遅延されてRSフリップフロップ回路41のリセット信号として与えられている。この構成によれば、瞬断回数がカウンタ43でカウントされるので、そのカウント値で接続不良の程度を知ることができる。

【0014】図1に示した信号発生装置24は、好ましくは周波数がスイープするような信号を出力するものである。この場合、図4に示すように、被検査ワイヤハーネス17や検査台11等に固有の共振周波数 $f_0$ を通過するように信号をスピーカ23に供給することにより、効率的な振動を被検査ワイヤハーネス17に印加することができる。

【0015】また、図5に示すように、検査台11のコネクタ部14～16が接続される部分に、共振周波数が異なる共振板51、52、53をそれぞれ装着して、コネクタ部14～16をこれら共振板51～53にそれぞれ固定するようにし、信号発生装置24で出力信号周波数をスイープするようにしても良い。この場合、図6に示すように、各共振板51、52、53が順番に共振することになるので、振動周波数と導通/瞬断検出装置22での瞬断検出タイミングとから、いずれのコネクタ部で接触不良が発生したかを検出することができる。

【0016】なお、以上の実施例では、振動/衝撃印加手段として、音波を利用したスピーカ23と信号発生装置24とを用いたが、例えば図7に示すように、被検査ワイヤハーネス17に、単発的な衝撃波を印加する衝撃印加装置61とこの衝撃印加装置61に単発信号を供給する信号発生装置62とを設け、衝撃印加装置61によって検査台11に単発的又は断続的な衝撃を加えることにより、瞬断検出を行うようにしても良い。この場合、衝撃印加装置61による衝撃印加ポイントPから各コネクタ部14、15、16までの距離 $L_1$ 、 $L_2$ 、 $L_3$ を異ならせておく。これにより、図8に示すように、衝撃印加タイミングから各コネクタ部14～16での瞬断タイミングまでの時間に差が出てくるので、この時間差を検出することにより、いずれのコネクタ部18～19での接触不良による瞬断であるかを検出することができる。

#### 【0017】

【発明の効果】以上述べたようにこの発明によれば、被検査ワイヤハーネスに電流を流した状態で、被検査ワイ

10

20

30

40

50

ワイヤハーネスに振動又は衝撃を印加して、その時の電流の瞬断の有無を検出することにより、被検査ワイヤハーネスの接続不良を検査するようにしているので、電気的には接続されているが、その接触圧が低い場合等の接続不良も確実に検知することができるという効果を奏する。

【図面の簡単な説明】

【図1】 この発明の一実施例に係るワイヤハーネス検査装置の構成を示す図である。

【図2】 同装置における導通/瞬断検出装置の要部の回路図である。

【図3】 同導通/瞬断検出装置の他の例を示す回路図である。

【図4】 同装置における信号発生装置の出力周波数とワイヤハーネスの共振周波数の関係を示す図である。

【図5】 本発明の他の実施例に係るワイヤハーネス検査装置の構成を示す図である。

【図6】 同装置の動作を説明するための各部の共振周波数を示す図である。

【図7】 本発明の更に他の実施例に係るワイヤハーネス検査装置の構成を示す図である。

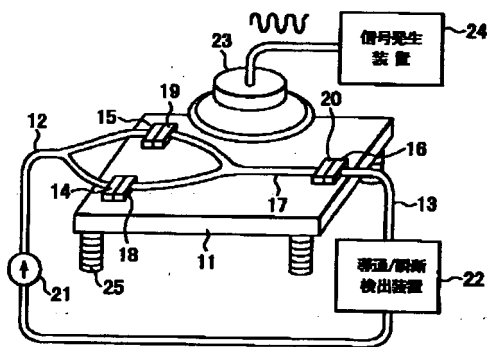
【図8】 同装置の動作を説明するためのタイミングチャートである。

【図9】 被検査ワイヤハーネスのコネクタ部の要部構成を示す断面図である。

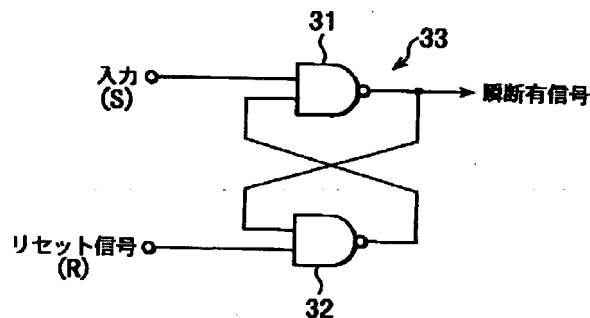
【符号の説明】

- 10 1…雌型端子、4…雄型端子、11…検査台、12, 13…導通検査用ワイヤハーネス、14~16, 18~20…コネクタ部、17…被検査ワイヤハーネス、21…電流源、22…導通/瞬断検出装置、23…スピーカ、24, 62…信号発生装置、51~53…共振板、61…衝撃印加装置。

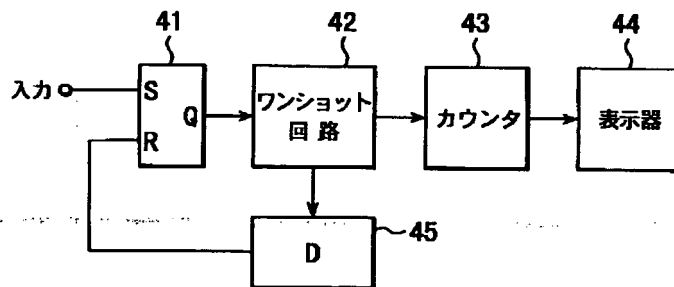
【図1】



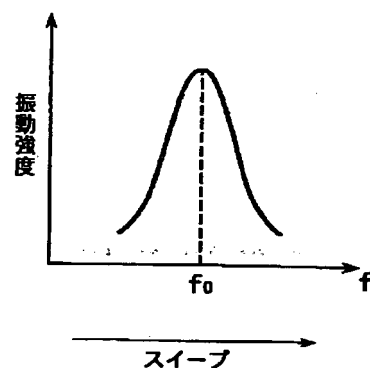
【図2】



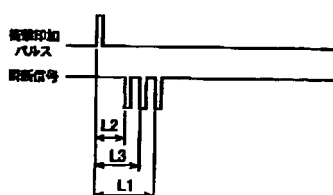
【図3】



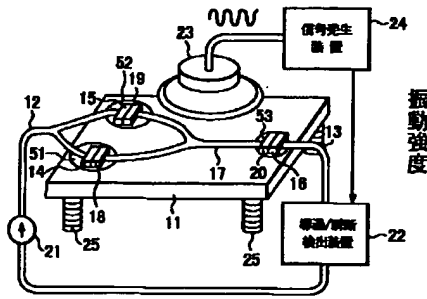
【図4】



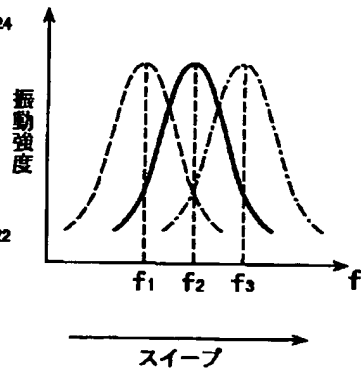
【図8】



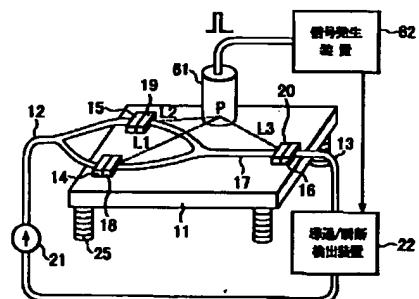
【図5】



【図6】



【图7】



【図9】

